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UK daily precipitation intensity: Extremes, trends and decadal variability

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We present an analysis of the decadal variability and recent trends in the intensity distribution of daily precipitation across the UK. We use a spatial network of 689 rain gauges covering almost the whole UK, spanning a time range from at least 1961-2000, in many cases from 1900 to 2006. For each station and season, we calculated ten time series of the contribution of ten precipitation amount categories to the total seasonal precipitation. A principal component analysis of post-1961 trends of all categories and stations is consistent with earlier results, namely, widespread shifts towards greater contribution from heavier precipitation categories during winter, and towards light and moderate categories during summer. Regional and UK average time series of the contribution from the category consisting of the heaviest events indicate that the earlier reported increased winter intensity was sustained during the most recent ten years, but the trend did not continue at the rate for 1961-1995. For summer, the decreasing contribution from the heaviest rainfall category for 1961-1995 underwent a reversal during the most recent decade, returning towards the 1961-1995 reference level of intensity. Confidence intervals for these regional and UK average time series were estimated by a bootstrap approach and indicate that the sparser observations from the first half of the 20th century are still sufficient to estimate UK average change. These longer records support the existence of a long-term increase in winter precipitation intensity, and similar trends are also evident in spring and (to a lesser extent) autumn. The summer rainfall intensity has exhibited changes that are more consistent with inter-decadal variability than any overall trend. We discuss the influence of possible driving factors as the large scale atmospheric circulation and humidity on the

variability of precipitation extremes.